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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Mark W. Roberts, Ph.D., Esq.
DORSEY & WHITNEY LLP
Suite 3400
1420 Fifth Avenue
Seattle, WA 98101

EXAMINER
PRENTY, MARK V

ART UNIT	PAPER NUMBER
2822	

DATE MAILED: 10/25/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	**Application No.** 10/683,977	**Applicant(s)** AHN ET AL.	
	Examiner MARK V PRENTY	**Art Unit** 2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 October 2003*.
2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.
3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-54* is/are pending in the application.
4a) Of the above claim(s) *42-54* is/are withdrawn from consideration.
5)☐ Claim(s) _____ is/are allowed.
6)☒ Claim(s) *1-8,11-14,18-23,25 and 29-39* is/are rejected.
7)☒ Claim(s) *9,10,15-17,24,26-28,40 and 41* is/are objected to.
8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.
10)☒ The drawing(s) filed on *22 June 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a)☐ All b)☐ Some * c)☐ None of:
1.☐ Certified copies of the priority documents have been received.
2.☐ Certified copies of the priority documents have been received in Application No. _____.
3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date *October 10, 2003*.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

This Office Action is in response to the papers filed on October 10, 2003.

As a first preliminary matter, claims 23, 26 and 27 are objected to because they do not end with a period. Correction is required.

As a second preliminary matter, dependent claims 18 and 19 are identical to dependent claims 11 and 12. Claims 18 and 19 apparently should depend on independent claim 13, not independent claim 1. Correction is required. Claims 18 and 19 are considered to depend on independent claim 13 for the purpose of this Office Action.

Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1-41, drawn to a semiconductor device, classified in class 257, subclass 411.

II. Claims 42-54, drawn to a method of making a semiconductor device, classified in class 438, subclass 287.

The inventions are distinct, each from the other because:

Inventions II and I are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the product as claimed can be made by another and materially different process, such as by forming the zirconium and lanthanide layers on a substrate and then oxidizing them.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

During a telephone conversation with Mark Roberts (Reg. No. 46,160) on October 19, 2004, a provisional election was made without traverse to prosecute the invention of Group I, claims 1-41. Affirmation of this election must be made by applicant in replying to this Office action. Claims 42-54 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Claims 1-8, 13, 14, 20-23, 25 and 31-39 are rejected under 35 U.S.C. 102(e) as being anticipated by Haukka et al. (United States Patent 6,660,660 – hereafter Haukka).

With respect to independent claim 1, Haukka discloses (see the entire patent, including the Fig. 1 disclosure, for example) a semiconductor structure comprising: a substrate material 40 and a composite laminate dielectric layer 15 formed on the substrate material, the composite laminate dielectric layer comprising: a layer 20 of ZrO_2; and a layer of a lanthanide oxide 10 on the ZrO_2 layer.

Claim 1 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Haukka.

With respect to dependent claim 2, Haukka's lanthanide oxide is selected from the group of Pr_2O_3, Nd_2O_3, Sm_2O_3, Gd_2O_3, Dy_2O_3 and PrTixOy (see column 6, lines 61-67).

Claim 2 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Haukka.

With respect to dependent claim 3, Haukka's composite laminate dielectric layer is a gate dielectric layer of a transistor (see the Fig. 1 disclosure, for example).

Claim 3 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Haukka.

With respect to dependent claim 4, Haukka's transistor is a component of a DRAM (see column 8, lines 38-48, for example).

Claim 4 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Haukka.

With respect to dependent claim 5, Haukka's composite laminate dielectric layer is a dielectric layer of a capacitor (see the Fig. 4 disclosure).

Claim 5 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Haukka.

With respect to dependent claim 6, Haukka's capacitor is a component of a DRAM (see column 8, lines 38-48, for example).

Claim 6 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Haukka.

With respect to dependent claim 7, Haukka's composite (ZrO_2/lanthanide oxide) laminate dielectric layer has a dielectric constant between about 12 and about 23 (note the specification at paragraph [022]).

Claim 7 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Haukka.

With respect to dependent claim 8, see Haukka's Fig. 4 disclosure and note that composite laminate dielectric layer 110's ZrO_2 layer 112 has a thickness of 3 nm (see column 10, lines 44-46).

Claim 8 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Haukka.

With respect to independent claim 13, Haukka discloses (see the entire patent, including the Fig. 1 disclosure) a semiconductor transistor comprising: a gate electrode 30; a source region and a drain region; and a gate dielectric layer 15 beneath the gate electrode and between the source and drain regions, the dielectric layer being a composite laminate dielectric layer comprising a first layer 20 of ZrO_2 and a second layer 10 of lanthanide oxide.

Claim 13 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Haukka.

With respect to dependent claim 14, Haukka's composite (ZrO_2/lanthanide oxide) laminate dielectric layer has a dielectric constant between about 12 and about 23 (note the specification at paragraph [022]).

Claim 14 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Haukka.

With respect to dependent claim 20, Haukka's lanthanide oxide is selected from the group of Pr_2O_3, Nd_2O_3, Sm_2O_3, Gd_2O_3, Dy_2O_3 and PrTixOy (see column 6, lines 61-67).

Claim 20 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Haukka.

With respect to dependent claim 21, Haukka discloses (see the entire patent, including the Fig. 4 disclosure) a semiconductor structure comprising: a first electrode 116; a second electrode 116, and a dielectric layer 110 separating the first and second electrodes, the dielectric layer being a composite laminate dielectric layer comprising a first layer 112 of ZrO_2 and a second layer 113 (or 114) of lanthanide oxide.

Claim 21 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Haukka.

With respect to dependent claim 22, Haukka's composite (ZrO_2/lanthanide oxide) laminate dielectric layer has a dielectric constant between about 12 and about 23 (note the specification at paragraph [022]).

Claim 22 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Haukka.

With respect to dependent claims 23 and 25, Haukka's ZrO_2 layer 112 has a thickness of 3 nm (see column 10, lines 44-46).

Claims 23 and 25 are thus rejected under 35 U.S.C. 102(e) as being anticipated by Haukka.

With respect to dependent claim 31, Haukka's lanthanide oxide is selected from the group of Pr_2O_3, Nd_2O_3, Sm_2O_3, Gd_2O_3, Dy_2O_3 and PrTixOy (see column 6, lines 61-67).

Claim 31 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Haukka.

With respect to independent claim 32, Haukka discloses (see the entire patent, including column 8, lines 38-48) a semiconductor memory device comprising: a capacitor (see the Fig. 4 disclosure) that includes a first dielectric material 110 separating a first and a second electrode 116; a transistor (see the Fig. 1 disclosure) that includes a second dielectric material 15 beneath a gate electrode 30 and between a source region and a drain region, and at least one of the first and second dielectric materials 110 and 15 is a composite laminate dielectric layer comprised of a first layer of material selected from the group consisting of ZrO_2 and lanthanide oxide and a second layer of material selected from the group consisting of ZrO_2 and a lanthanide oxide on the first layer of material, the second layer of material being different from the first layer of material.

Claim 32 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Haukka.

With respect to dependent claim 33, Haukka's lanthanide oxide is selected from the group of Pr_2O_3, Nd_2O_3, Sm_2O_3, Gd_2O_3, Dy_2O_3 and PrTixOy (see column 6, lines 61-67).

Claim 33 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Haukka.

With respect to dependent claim 34, Haukka's first dielectric material 110 is comprised of the composite laminate dielectric layer.

Claim 34 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Haukka.

With respect to dependent claim 35, Haukka's second dielectric material 15 is comprised of the composite laminate dielectric layer.

Claim 35 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Haukka.

With respect to dependent claim 36, each of Haukka's first and second dielectric material 110 and 15 is comprised of the composite laminate dielectric layer.

Claim 36 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Haukka.

With respect to dependent claim 37, Haukka's device is a DRAM (see column 8, lines 38-48).

Claim 37 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Haukka.

With respect to dependent claim 38, Haukka's composite (ZrO_2/lanthanide oxide) laminate dielectric layer has a dielectric constant between about 12 and about 23 (note the specification at paragraph [022]).

Claim 38 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Haukka.

With respect to dependent claim 39, Haukka's ZrO_2 layer 112 has a thickness of 3 nm (see column 10, lines 44-46).

Claim 39 is thus rejected under 35 U.S.C. 102(e) as being anticipated by Haukka.

Claims 11 and 12 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Haukka et al. (United States Patent 6,660,660 – hereafter Haukka). Specifically, claims 11 and 12 depend on independent claim 1, which is rejected under 35 U.S.C. 102(e) as being anticipated by Haukka (see above). The above explanation of the rejection of independent claim 1 under 35 U.S.C. 102(e) as being anticipated by Haukka is hereby incorporated by reference into this rejection of dependent claims 11 and 12 under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Haukka. The difference, therefore, between device claims 11 and 12 and Haukka's device is a process one (i.e., claims 11 and 12 recite that independent device claim 1's ZrO_2 and lanthanide oxide layers are formed by certain processes). Insofar as claim 11's and claim 12's ZrO_2 and lanthanide oxide layers appear to be structurally the same as or similar to Haukka's ZrO_2 and lanthanide oxide layers (in view of their similar use, for example), claims 11 and 12 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Haukka. See MPEP 2113.

Claims 18 and 19 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Haukka et al. (United States Patent 6,660,660 – hereafter Haukka). Specifically, claims 18 and 19 (apparently should) depend on independent claim 13 (see above), which is rejected under 35 U.S.C. 102(e) as being anticipated by Haukka (see above). The above explanation of the rejection of independent claim 13 under 35 U.S.C. 102(e) as being anticipated by Haukka is hereby incorporated by reference into this rejection of dependent claims 18 and 19 under 35

U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Haukka. The difference, therefore, between device claims 18 and 19 and Haukka's device is a process one (i.e., claims 18 and 19 recite that independent device claim 13's ZrO_2 and lanthanide oxide layers are formed by certain processes). Insofar as claim 18's and claim 19's ZrO_2 and lanthanide oxide layers appear to be structurally the same as or similar to Haukka's ZrO_2 and lanthanide oxide layers (in view of their similar use, for example), claims 18 and 19 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Haukka. See MPEP 2113.

Claims 29 and 30 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Haukka et al. (United States Patent 6,660,660 – hereafter Haukka). Specifically, claims 29 and 30 depend on independent claim 21, which is rejected under 35 U.S.C. 102(e) as being anticipated by Haukka (see above). The above explanation of the rejection of independent claim 21 under 35 U.S.C. 102(e) as being anticipated by Haukka is hereby incorporated by reference into this rejection of dependent claims 29 and 30 under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Haukka. The difference, therefore, between device claims 29 and 30 and Haukka's device is a process one (i.e., claims 29 and 30 recite that independent device claim 21's ZrO_2 and lanthanide oxide layers are formed by certain processes). Insofar as claim 29's and claim 30's ZrO_2 and lanthanide oxide layers appear to be structurally the same as or similar to Haukka's ZrO_2 and lanthanide oxide layers (in view of their similar use, for example), claims 29 and 30 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Haukka. See MPEP 2113.

Claims 9, 10, 15-17, 24, 26-28, 40 and 41 are objected to as being dependent upon a rejected base claim, but would be allowable over the prior art of record if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The prior art of record does not disclose or suggest the allowable semiconductor devices taken as a whole, including the composite laminate dielectric layer.

Registered practitioners can telephone the examiner at (571) 272-1843. Any voicemail message left for the examiner must include the name and registration number of the registered practitioner calling, and the Application/Control (Serial) Number. Technology Center 2800's general telephone number is (571) 272-2800.

Mark Prenty
Mark V. Prenty
Primary Examiner